

In re Patent Application of:

AMMAR

Serial No. **09/862,982**

Filing Date: **May 22, 2001**

REMARKS

Claims 1-15 remain in this application. Claims 16-20 have been previously cancelled. Claims 1 and 10 have been amended.

Applicant thanks the Examiner for the detailed study of the application and prior art.

At the outset, Applicant has amended independent Claims 1 and 10 to define in greater detail the novel and unobvious structure of the microwave monolithic integrated circuit (MMIC) package of the present invention. This package is not only configured to allow automatic pick and placement, such as on a circuit board, for example, with surface mount parts, but also configured to expose any pads on the MMIC for bonding without intermediate leads, such as to the circuit board.

In the present invention, the MMIC chip is protected in a coefficient of thermal expansion (CTE) matched package at a very low cost. It is amenable to improved automatic pick and placement for surface mounting applications and direct wire bonding and ribbon bonding without causing damage to the fragile MMIC.

Applicant stresses that the present claimed invention is much different from the cited prior art. Applicant agrees that the prior art discloses numerous types of MMIC chip packages. The prior art, however, typically has the MMIC chip mounted on a plate or by other means, including solder, with intermediate connections from the pads to other connections, which are then made to a circuit board, traces or other connector assembly. The present claimed invention, on the other hand, is a single MMIC chip mounted within the

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package formed by the base plate and chip cover with openings and covering the MMIC chip. The package can be automatically picked and placed and any pads on the MMIC are directly exposed by the openings for direct wire and ribbon or other bonding to a circuit board without requiring intermediate leads as in the prior art. The present invention is a simplified MMIC chip package without intermediate leads.

Applicant notes that the Examiner has initially rejected Claims 1-3 and 6-15 as obvious over Ziegner in view of Koizumi and further in view of Goto. Other dependent claims were rejected as unpatentable over those references in view of Harris or Hayakawa.

Although Applicant agrees that Ziegner shows a packaged integrated circuit for a MMIC, including a base plate and cover to form a housing, Ziegner actually teaches away from the present claimed invention because Ziegner uses intermediate connectors (i.e., leads). The present claimed invention, on the other hand, is a MMIC package including a single MMIC, base plate and chip cover forming a package that can be automatically picked and placed. The pads of the MMIC are directly exposed for wire and ribbon bonding without intermediate leads.

It is clear that Ziegner uses intermediate leads (connectors) and the pads are not directly exposed for connection to a circuit board, such as by ribbon or wire bonding. Ziegner follows standard prior art practices and specifically discloses the base 22, cover 24 and the pair of interconnects 26 with a spring clip 28. The package 20 can be electrically connected to conductive traces 38 on a printed wiring board 36 via the interconnects 26 acting as

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intermediate leads on the package base 22. This is the exact opposite of the present claimed invention where the package can be automatically picked and placed and the pads are directly exposed for wire and ribbon (or other) bonding without intermediate leads.

Paragraph 3, starting at line 26 of Ziegner clearly sets forth these differences and states:

"As shown in FIG. 3, the package 20 is mountable on a substrate, such as on a printed wiring board 36, or a printed circuit board, having conductive traces 38 thereon. For example, the package 20 may be mountable on an FR4 printed wiring board. The package 20 may be mounted onto the surface of the printed wiring board 36, or, as shown, the package 20 may be mounted directly to a metal plate 40 supporting the printed wiring board 36 by having the printed wiring board 36 relieved in the affected area 41. In both cases, the package 20 preferably becomes mounted with respect to the printed wiring board 36 such that the integrated circuit 30 in the package 20 becomes electrically connected to conductive traces 38 on the printed wiring board 36 via the interconnects 26 on the package base 22. This mounting and resulting electrical connection will be described more fully later herein."

Koizumi discloses a hermetically sealed MMIC package. Koizumi also teaches opposite from the present claimed invention because the Koizumi hermetic sealing requires intermediate leads and does not have the pads of the MMIC chip directly exposed for wire and ribbon bonding on a board without intermediate leads. Without going into

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excessive detail of Koizumi, which is not necessary, it is evident that the inner leads 25 on a tape carrier 20 are joined to electrodes by thermocompression bonding. The Koizumi package is hermetically sealed with a number of ground leads, signal leads and power supply leads operative with the tape carrier 20. Koizumi requires a number of different intermediate leads and a complicated structure to form its hermetically sealed package. Thus, it is evident that the primary Ziegner and secondary Koizumi references teach away from the present claimed invention.

As to Goto, used by the Examiner to show a chip and lid cover with holes to expose the substrate and permit waveguides to connect externally, Applicant notes that Goto is directed to preventing a change of input/output characteristics of a semiconductor device even when a substrate of the semiconductor device warps. Goto has a waveguide terminal structure that connects waveguides to the package. Nowhere does Goto suggest the simplified chip package having the base plate and chip cover with openings and configured to have directly exposed pads for wire and ribbon bonding on a board without intermediate leads. At most, Goto only suggests an opening in a package to place a waveguide channel, but nowhere suggests the present claimed invention.

Harris is used to teach the use of a plastic cover, but Applicant notes that Harris shows intermediate leads (FIGS. 1-3) with a wire 112 that electrically connects the die 110 to pads 114. It also teaches the connection of an external circuit by conductors 106. Harris uses intermediate leads and is opposite the present claimed invention.

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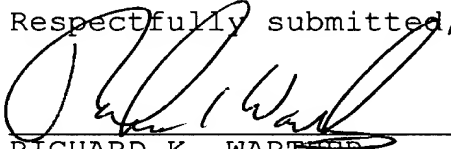
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Hayakawa is used by the Examiner to teach a solder preform. Hayakawa also shows intermediate connections and no direct exposure of the pads in the MMIC chip package to allow wire and ribbon bonding on a board without intermediate leads.

Applicant contends that the cited prior art neither singularly or in combination suggests the present claimed invention as now set forth with the present Amendment.

Applicant contends that the present case is in condition for allowance and respectfully requests that the Examiner issue a Notice of Allowance and Issue Fee Due. If the Examiner has any questions or suggestions for placing this case in condition for allowance, the undersigned attorney would appreciate a telephone call.

Respectfully submitted,



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